

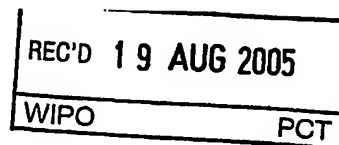
## PATENT COOPERATION TREATY



## PCT

## INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)



Applicant's or agent's file reference H2064-01	<b>FOR FURTHER ACTION</b>		See Form PCT/PEA/416
International application No. PCT/JP2004/005283	International filing date (day/month/year) 14.04.2004	Priority date (day/month/year) 16.04.2003	
International Patent Classification (IPC) or national classification and IPC H05K3/12			
Applicant MATSUSHITA ELECTRIC INDUSTRIAL CO., LTD.			
<p>1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of 5 sheets, including this cover sheet.</p> <p>3. This report is also accompanied by ANNEXES, comprising:</p> <p>a. <input checked="" type="checkbox"/> sent to the applicant and to the International Bureau) a total of 6 sheets, as follows:</p> <p><input type="checkbox"/> sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).</p> <p><input type="checkbox"/> sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.</p> <p>b. <input type="checkbox"/> (sent to the International Bureau only) a total of (Indicate type and number of electronic carrier(s)) , containing a sequence listing and/or tables related thereto, in computer readable form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).</p>			
<p>4. This report contains indications relating to the following items:</p> <p><input checked="" type="checkbox"/> Box No. I Basis of the opinion</p> <p><input type="checkbox"/> Box No. II Priority</p> <p><input type="checkbox"/> Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</p> <p><input type="checkbox"/> Box No. IV Lack of unity of invention</p> <p><input checked="" type="checkbox"/> Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</p> <p><input type="checkbox"/> Box No. VI Certain documents cited</p> <p><input checked="" type="checkbox"/> Box No. VII Certain defects in the international application</p> <p><input checked="" type="checkbox"/> Box No. VIII Certain observations on the international application</p>			
Date of submission of the demand  07.02.2005		Date of completion of this report  17.08.2005	
Name and mailing address of the international preliminary examining authority:  European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465		Authorized Officer Batev, P Telephone No. +49 89 2399-7970 	

**INTERNATIONAL PRELIMINARY REPORT  
ON PATENTABILITY**

International application No.  
PCT/JP2004/005283

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**Box No. I Basis of the report**

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1. With regard to the **language**, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.
- ☐ This report is based on translations from the original language into the following language , which is the language of a translation furnished for the purposes of:
- ☐ international search (under Rules 12.3 and 23.1(b))
  - ☐ publication of the international application (under Rule 12.4)
  - ☐ international preliminary examination (under Rules 55.2 and/or 55.3)
2. With regard to the **elements\*** of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report):*

**Description, Pages**

1-78 as originally filed

**Claims, Numbers**

1-5, 7-17, 19-27 received on 21.07.2005

**Drawings, Sheets**

1/14-14/14 as originally filed

- ☐ a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing

3. ☐ The amendments have resulted in the cancellation of:
- ☐ the description, pages
  - ☐ the claims, Nos.
  - ☐ the drawings, sheets/figs
  - ☐ the sequence listing (*specify*):
  - ☐ any table(s) related to sequence listing (*specify*):
4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).
- ☐ the description, pages
  - ☐ the claims, Nos.
  - ☐ the drawings, sheets/figs
  - ☐ the sequence listing (*specify*):
  - ☐ any table(s) related to sequence listing (*specify*):

\* If item 4 applies, some or all of these sheets may be marked "superseded."

**INTERNATIONAL PRELIMINARY REPORT  
ON PATENTABILITY**

International application No.  
PCT/JP2004/005283

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**Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

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**1. Statement**

Novelty (N)	Yes: Claims	1-5,7-17,19-27
	No: Claims	none
Inventive step (IS)	Yes: Claims	1-5,7-17,19-27
	No: Claims	none
Industrial applicability (IA)	Yes: Claims	1-5,7-17,19-27
	No: Claims	none

**2. Citations and explanations (Rule 70.7):**

**see separate sheet**

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**Box No. VII Certain defects in the international application**

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The following defects in the form or contents of the international application have been noted:

**see separate sheet**

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**Box No. VIII Certain observations on the international application**

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The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

**see separate sheet**

**Re Item V**

**Reasoned statement with regard to novelty, inventive step or industrial applicability;  
citations and explanations supporting such statement**

Reference is made to the following document/s/:

- D1: US-B-6 306 2041 (LIN JOHN WEI-PING) 23 October 2001 (2001-10-23)
- D2: PATENT ABSTRACTS OF JAPAN vol. 1998, no. 13, 30 November 1998 (1998-11-30) & JP 10 204350 A (SEIKO EPSON CORP), 4 August 1998 (1998-08-04)
- D3: US 2002/151161 A1 (FURUSAWA MASAHIRO) 17 October 2002 (2002-10-17)
- D4: EP-A-1 139 455 (SEIKO EPSON CORP) 4 October 2001 (2001-10-04)

1. Document D1 discloses (see e.g. col. 3, l. 28 - col. 4, l. 25) a discharging solution for forming patterns on a surface of a base, the solution comprising organic molecules having fluoroalkyl chains as a first pattern formation material, wherein the organic molecules contain a hydroxy group the surface tension of the solution being 0.45 mN/cm.

The subject matter of claim 1 differs from this known solution in that the organic molecules containing a hydroxy group are molecules of a straight chain.

The straight chain molecules containing a hydroxy group are more likely to form a self accumulated monomolecular layer on a substrate than the molecules which are not of a straight chain (i.e. the molecules known from document D1). Thus, the solution proposed in claim 1 forms more easily a water-repellent film on the surface of the substrate and undesired spreading of the discharged solution is prevented.

The other cited documents (D2-D4) all relate to methods of producing electronic devices but do not disclose a discharging solution having a surface tension of 0.2 mN/cm or more, in which organic molecules having fluoroalkyl chains are dissolved as a pattern formation material.

The subject matter of claim 1 appears, therefore, to involve an inventive step (Article 33(3) PCT).

2. Independent claim 12 is directed to a method of producing patterns, in which the inventive solution of claim 1 is used. Consequently the subject-matter of this claim also

seems new and inventive.

3. Claims 2 - 5, 7 - 11, 13 - 17 and 19 - 27 which define preferred embodiments of the invention are dependent on claim 1 or claim 12, respectively, and as such also appear to meet the requirements of the PCT in respect of novelty and inventive step.

**Re Item VII**

**Certain defects in the international application**

1. Contrary to the requirements of Rule 5.1(a)(ii) PCT, the relevant background art disclosed in the documents D1 - D4 is not mentioned in the description, nor are these documents identified therein (see also the Guidelines, paragraph 4.05).

2. The claims are not numbered consecutively (see Rule 6.1(b) PCT).

**Re Item VIII**

**Certain observations on the international application**

1. The word "similar" used in independent claim 26 has no well-recognised meaning and renders the definition of the subject-matter unclear (Guidelines, Chapter III-4.5). Using the expression "similar figure of geometry" does not overcome this deficiency.

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## CLAIMS

1. (Amended) A discharging solution for forming patterns on a surface of a base, comprising organic molecules having fluoroalkyl chains as a first  
5 pattern formation material,  
wherein the organic molecules are at least one selected from the group consisting of : organic molecules containing at least one group selected from a chlorosilyl group, an alkoxy group, a mercapto group, ~~a hydroxy group, and an~~  
~~amine group~~; organic molecules of a straight chain containing a carboxy group  
10 or hydroxy group or an amino group; disulfide; silazane; and dithiol;  
wherein the surface tension of the solution is 0.02 N/m (20 dyne/cm) or more.
2. The discharging solution according to claim 1, further comprising a second  
15 pattern formation material.
3. The discharging solution according to claim 2, wherein the second pattern formation material contains at least one kind of material selected from the group consisting of a precursor of a metal-oxide dielectric, a semiconductor,  
20 metal, and a polymer.
4. The discharging solution according to claim 3, wherein the second pattern formation material is the metal and the metal is a metal colloid.
- 25 5. The discharging solution according to claim 3, wherein the second pattern formation material is the polymer and the polymer is at least one kind selected from the group consisting of a conductive polymer, a semiconductor polymer, an insulting polymer, and a light-curable polymer.

6. (Canceled)

7. The discharging solution according to claim 1, wherein the organic  
5 molecules are at least one selected from the group consisting of molecules  
represented by a composition formula:  $\text{CF}_3(\text{CF}_2)_n\text{C}_2\text{H}_4\text{Si}\{(\text{O}-\text{CH}_2\text{CH}_2)_m-\text{OR}^1\}_3$ ,  
and hydrolysate of the molecules, and

in the composition formula,  $\text{R}^1$  is a methyl group, an ethyl group, a  
propyl group, or a butyl group, and  $n$  and  $m$  are natural numbers of 1 to 10.

10

8. The discharging solution according to claim 3, wherein the second pattern  
formation material is the precursor of the metal-oxide dielectric and the  
precursor of the metal-oxide dielectric is at least one selected from the group  
consisting of metal alkoxide, metal acetylacetonate, metal carboxylate, and a  
15 metal inorganic compound.

9. The discharging solution according to claim 5, wherein the polymer is the  
semiconductor polymer and the semiconductor polymer is at least one selected  
from the group consisting of polyalkylthiophene and  
20 poly-9,9'-dialkyl-fluorene-co-bithiophene.

10. The discharging solution according to claim 1, wherein a boiling point of a  
solvent contained in the solution is 80°C or higher.

25 11. The discharging solution according to claim 1, wherein the solution is  
applicable for forming patterns on a surface of a base by an ink-jet method.

12. (Amended) A method for producing patterns comprising:

discharging a solution having a surface tension of 0.02 N/m (20 dyne/cm) or more, in which organic molecules having fluoroalkyl chains are dissolved as a first pattern formation material, to a surface of a base by an ink-jet method to perform drawing; and

5            wherein the organic molecules are at least one selected from the group consisting of: organic molecules containing at least one group selected from a chlorosilyl group, an alkoxy group, a mercapto group, ~~a hydroxy group, and an amino group~~; organic molecules of a straight chain containing a carboxy group or hydroxy group or an amino group; disulfide; silazane; and dithiol;

10           evaporating a solvent contained in the discharged solution to form patterns containing the organic molecules.

13. The method for producing patterns according to claim 12, the solution further comprising a second pattern formation material, the method  
15   comprising evaporating a solvent contained in the discharged solution to form patterns containing the organic molecules and the second pattern formation material.

14. The method for producing patterns according to claim 13, comprising  
20   evaporating a solvent contained in the discharged solution to form patterns including a first pattern region containing a relatively large amount of the organic molecules and a second pattern region containing a relatively large amount of the second pattern formation material,

             wherein the patterns are formed so that the first pattern region is  
25   present on the base side with respect to the second pattern region.

15. The method for producing patterns according to claim 13, wherein the second pattern formation material contains at least one kind of material



selected from the group consisting of a precursor of a metal-oxide dielectric, a semiconductor, metal, and a polymer.

16. The method for producing patterns according to claim 15, wherein the  
5 second pattern formation material is the metal and the metal is a metal colloid.

17. The method for producing patterns according to claim 15, wherein the  
10 second pattern formation material is the polymer and the polymer is at least one kind selected from the group consisting of a conductive polymer, a semiconductor polymer, an insulting polymer, and a light-curable polymer

18. (Canceled)

15 19. The method for producing patterns according to claim 12, wherein the organic molecules are at least one selected from the group consisting of molecules represented by a composition formula:  
$$\text{CF}_3(\text{CF}_2)_n\text{C}_2\text{H}_4\text{Si}\{(\text{O}-\text{CH}_2\text{CH}_2)_m-\text{OR}^1\}_3$$
 and hydrolyzate of the molecules, and  
in the composition formula,  $\text{R}^1$  is a methyl group, an ethyl group, a  
20 propyl group, or a butyl group, and  $n$  and  $m$  are natural numbers of 1 to 10.

20. The method for producing patterns according to claim 15, wherein the  
second pattern formation material is the precursor of the metal-oxide  
dielectric and the precursor of the metal-oxide dielectric is at least one  
25 selected from the group consisting of metal alkoxide, metal acetylacetonate, metal carboxylate, and a metal inorganic compound

21. The method for producing patterns according to claim 17, wherein the

polymer is the semiconductor polymer and the semiconductor polymer is at least one selected from the group consisting of polyalkylthiophene and poly-9,9'dialkyl-fluorene-co-bithiophene

- 5     22. The method for producing patterns according to claim 12, wherein a boiling point of the solvent is 80°C or higher.

23. The method for producing patterns according to claim 12, wherein, when the solution is discharged to the surface of the base, a surface temperature of  
10     the base is set to be lower by 5°C or more than a temperature of the solution to be discharged to the surface of the base.

24. A method for producing an electronic device comprising a method for producing patterns that includes:

- 15             discharging a solution having a surface tension of 0.02 N/m (20 dyne/cm) or more, in which organic molecules having fluoroalkyl chains are dissolved as a first pattern formation material, to a surface of a base by an ink-jet method to perform drawing, the solution further containing a second pattern formation material; and

- 20             evaporating a solvent contained in the discharged solution to form patterns containing the organic molecules and the second pattern formation material.

25. The method for producing an electronic device according to claim 24,  
25     wherein the second pattern formation material is at least one kind of material selected from the group consisting of a precursor of a metal-oxide dielectric, a semiconductor, metal, and a polymer, and

the electronic device is at least one selected from the group consisting

of metal wiring, an electrode, a transistor, a resistor, a capacitor, a microlens, and an imaging device.

26. (Amended) An electronic device comprising a base and patterns formed  
5 on a surface of the base,

wherein the patterns include a first pattern region containing organic molecules having fluoroalkyl chains and a second pattern region containing at least one selected from metal, a semiconductor, a metal oxide, and a polymer,

10 the first pattern region and the second pattern region are stacked in this order on the surface of the base, and

a shape of the first pattern region is similar figure of geometry to a shape of the second pattern region.

27. The electronic device according to claim 26, wherein the first pattern  
15 region is a monomolecular film of the organic molecules.